Journal of the Society of Arts.

FRIDAY, JULY 25, 1856.

ELECTION OF ASSISTANT-SECRETARY.

There were one hundred candidates for the office of Assistant-Secretary. To reduce this number, the Council appointed a Committee (on which no Examiner was placed) to investigate the antecedents and claims of the various candidates. This Committee reported the names of sixteen gentlemen as fitting candidates for the office. The candidates were examined by the Rev. Dr. Booth, D.C.L., F.R.S.; Professor Brewer, of King's College; Professor Brown, of King's College; the Rev. W. Elliott; Professor Mariette, of King's College; and Dr. Wintzer, of King's College, who were selected by the Council to conduct the examination.

On the close of the examination, the Examiners returned the names of the five following gentlemen as having acquitted themselves the best in the trial:—

Edward Holmes } equal.
Charles Critchett }
M. H. Wilkin.
Dr. Henry.
J. P. Bidlake.

The Council have elected Mr. Critchett to the office.

EXAMINATIONS FOR 1857.

The Council have determined to hold the Examinations next year during the week commencing the 1st of June, 1857, simultaneously at the Society's House and at some central locality in the North of England, to be settled hereafter as best suited to meet the convenience of distant Institutions.

UNION OF COLONIAL INSTITUTIONS.

At the meeting of the Council held on the 23rd instant, the following Colonial Institutions were taken into Union, in accordance with the Resolution of Council of the 19th of December, 1855:—

Graham's Town Medical Society.
Kandy (Ceylon) Agricultural and Horticultural Society.

ON NEGATIVE ARTESIAN WELLS, OR ABSORBING BORED WELLS, AS A MEANS OF DRAINING LANDS, FARMS, BUILDINGS, &c.*

By AUGUSTUS EDWARD BRUCKMANN, PH. DR., CONSULTING ENGINEER AND GEOLOGIST.

First Division.—General Considerations.

It is well known that the so-called "artesian wells" represent perforations which are carried down into the different strata of the geological formations, and from which spring-water ascends above the surface of the earth.† On the other hand, we must conceive "negative artesian wells," or "absorbing bored wells," as perforations into which are led those waters which it is desired to get rid of, because they are troublesome and detrimental to trade, agriculture, and health; waters which have been hitherto generally got rid of by expensive systems of channels, galleries, sewers or drains, &c., and in later times, in draining for agricultural purposes, by earthenware pipes, &c., a method now generally in use.

When my father, the late J. A. von Bruckmann, the Royal Wirtemberg Government Surveyor of Buildings, introduced artesian wells into Wirtemberg, between the years 1820 and 1830,‡ he conceived at the same time the idea of establishing absorbing bored wells, and communicated it to me, then his pupil.

In the summer of the year 1827 it happened at Heilbronn, on the Neckar, that in consequence of a heavy thunder storm, acccompanied by a water spout, near the town, a large area of cultivated and fertile fields, situated in a gentle depression of the ground, was entirely submerged; a lake was formed by this accident, the stagnant water of which threatened to destroy all the produce of the field laid under water. In order to get rid of the latter, which for want of a fall in the ground could not be drained in the common way, my father proposed the sinking of an absorbing bore hole at that place, through the diluvium lying on muschel-kalk there. The execution of it was undertaken but not finished, because it so happened that the evaporation in the then hot summer days was so powerful, that the lake disappeared before the perforation had been entirely completed.

This boring was the first in Wirtemberg designedly undertaken for the purpose of carrying off injurious water, and probably the first in the whole of Germany; at least, no account of absorbing bored wells from other parts, even from foreign countries, was known at that time. It is probable that about that time, or, at least, soon afterwards, between the years 1830 and 1840, works of a similar kind were undertaken in France, and, as far as I know, the first account of this subject was given in the year 1833, by Messrs. Girard and Rarent-Duchatelet, in the tenth volume of the "Annales d'Hygiène Publique et de Médecine Légale," under the title, "Des Puits Forés ou Artésiens, employés à l'Evacuation des Eaux Sales et Infectes et à l'Assainissement de Quelques Fabriques; rapport fait à M. le Conseiller d'Etat Préfet

* This paper is translated from the German by the author, with considerable modifications and additions, suitable to the English conditions of draining. The author has come to reside in England, with the object of carrying out his plans in this country in suitable localities.

† In reference to historical, constructive, and other peculiarities of the artesian wells, see the work by my father and myself:—"Vollstandige Anleitung zur Anlage, Fertigung und neueren Nutzanwendung der gebohrten oder sogenannten artesischen Brunnen. Grosstentheils auf eigene Erfahrung gegrundet und fur die praktische Ausfuhrung bearbeitet von J. A. von Bruckmann, Konigl. Wurttemb. Baurath, Ritter des K. Civil-Verdienst-Ordens und seinem Sohne Dr. A. H. Bruckmann, Architekt. Mit neun Steintafeln, Zweite Auflage, Heilbronn am Neckar, I. D. Classische Buchhandlung, 1838. (Erste Auflage, 1833.)

‡ His Majesty, King William I. of Wirtemberg, bestowed upon my father a gold medal of honour for his having introduced artesian wells into Wirtemberg

de Police." Another treatise on negative artesian wells known to me, was published by M. Arago, in the "Annuaire" for the year 1835, in his very interesting memoir, "Sur les puits forés, connus sous le nom de puits Artésiens, de Fontaines Artésiennes, ou de Fontaines Jaillissantes;" and it has this inscription—"On fore quelquefois le sol pour jeter dans les entrailles de la terre des eaux qui, retenues à la surface sur des bancs imperméables d'argile ou de pierre, rendraient de grandes étendues de pays marécageuses, et impropres à la culture." Another notice on this subject is to be found in the "Annales des Ponts-et-Chaussées for 1835 (tome 13, tirage 1840), p. 126. Besides, M. A. Chevalier wrote on this subject in the "Journal des Connaissances Usuelles," in the month of December, 1835; and so did M. J. Degoussée, in his "Guide du Sondeur" (Paris, 1847). As for Germany, I myself wrote on absorbing bored wells in the "Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg." 9th Jahrgang, 1853, 3 Heft, describing the works which I established for the Count of Maldeghem, in the year 1852; and my treatise is to be found there, under the title "Negative artesische Brunnen (absorbirende Bohrbrunnen) im Molassen—und Juragebirge, zur Ableitung des Wassers aus den Grâflich von Maldeghem'schen Lagerbierkellern in Stetten ob Lonthal" (Mit einem Situationsplan).

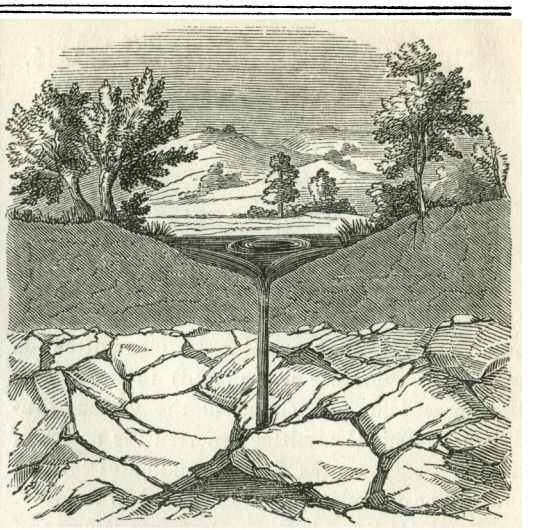
As to what, up to this time, in England, has been done in regard to absorbing bored wells, or, rather, has not yet been done, and still remains to be done, I shall have an opportunity of speaking in the course of this paper.

Experience has taught us, in establishing artesian wells in all countries and geological formations, that frequently positive and negative strata, that is, such as supply and such as absorb water, alternate with each other, a phenomenon which, if we proceed in a proper manner, involves the necessity of shutting off the latter with strong waterproof tubes, in order to permit the rising of a bored spring above the surface of the soil, or, at least, to avoid considerable loss of water. This we have already, on the evidence of our own experience, expressed in the first edition of our above quoted work in the year 1833, page 181.

In the muschelkalk formation, for example, where positive and negative strata occur alternately and irregularly, it is seldom possible to succeed in completing a rising spring-well without such an enclosure.*

Thus, if nature generally presents these positive and negative phenomena in conjunction with each other, it is obvious that the establishment of absorbing bored wells cannot be very limited. It has been reserved for modern times to develope this important object, and to give it, when placed in proper hands, practical importance in everyday life. Up to the present time, very little has been performed in this way.

Negative artesian wells admit, in respect of the removal of injurious waters, of numerous applications and combinations, as well as others, of which we shall shortly speak, and which reflecting minds will find out. The woodcut in the next column, for instance, represents the ideal section of a lake or a swamp which is to be drained, or the water drawn off, in order to obtain fertile soil for culture, or to remove stagnant waters, which now create and diffuse a noxious atmosphere detrimental to health. We suppose the upper deposit of the ground, whatever its thickness may be, as impervious to water, consisting, for example, of potter's clay, or clay marl, which retains the water, but under it an irregularly fissured deposit (say limestone or sandstone), the veins or cavities of which communicate with deeper lying springs, a lake, a river, the sea, or a slope of a hill, even if the distance should be a considerable one. Now, if the upper compact bed, which in nature may offer an alternation of different strata, is perforated, and the hole in the lower situated deposit carried down to a



ramified cleft or cavern, then the immediate consequence of this operation must be, that the water of the lake or swamp rushes down in the bore-hole, is carried away, and the latter will be drained sooner or later, according to the capacity of absorption of the cleft and the diameter of the bore-hole.

I give this for the present as a simple ideal example, for I shall soon speak of realities, but whilst on this point, I am naturally led to the question, whether the same means might not be applied to the drainage of the Kopaës or Tobol Lake, in Greece, discussed by Fiedler,* in the district where, in ancient times, there flourished twelve rich villages, with half a million of inhabitants, but now the abode of millions of frogs and fish, with swamps full of reeds and sedges—if a certain number of bore-holes, about a foot in diameter, were carried down in the fissured hard chalk of that district? This can only be determined by fresh researches, to be made on the spot for this purpose.

In the construction of negative artesian wells we shall not always in boring meet with fissures. We shall often meet with subterraneous currents of water of a certain sectional height, partly filled with sand and pebbles, &c., which engulph and carry away the waters to be drawn off. Moreover, as artesian wells, executed in fletz-formations, for the most part represent *piezometers*,† we shall observe on the shores of the sea, where positive artesian wells during the flood furnish more water than during the ebb,‡ the opposite phenomenon, that is to say, we shall observe that absorbing bored wells are able to take in and carry off a smaller quantity of water during the flood, and a larger quantity during the ebb, because the flood produces a greater hydrostatic pressure

* "Muschelkalk," corresponding to "shelly-limestone;" *French*, calcaire coquiller, calcaire horizontal.

* Reise durch alle Theile des Konigreichs Griechenland in Auftrag der Konigl. Griechischen Regierung in den Jahren, 1834 bis 1837. Von Dr. Karl Gustav Fiedler, Konigl. Sachs. Berg. Commissar, &c. Erster Theil, Mit sechs lith. Ansichten. Leipzig, Friedrich Fleischer, 1840.—Page 100 and so on.

† Compare: Theorie der artesischen Brunnen, nebst einer vollstandigen Anleitung zur Nutzanwendung dieser Brunnen in der Gewerben und der Landwirthschaft; von I. B. Viollet. Deutsche-Ausgabe, vermehrt mit fortlaufenden kritischen, Zusetzen und Erlauterungen nach eigenen vielfaltigen Beobachtungen und Erfahrungen von Dr. A. E. Bruckmann. Mit sieben Steintafeln und zwei Tabellen. Ulm, 1842. Wagnersche Verlagsbuchhandlung und Buchruckerei (J. A. Walter.)

‡ M. Baillet has described the influence which the flood exerts on the fountain at Royelle-sur-mer, in France; see "Bulletin de la Société d'Encouragement pour l'Industrie Nationale à Paris," 1822, p. 175; and also, M. Arago's account "De l'Effet des Marées sur quelques Fontaines Artésiennes" in the "Annuaire" for the year 1855, pp. 231—233.

upon the water-strata discharging into the sea than the ebb.

Even strata of sand, gravel, sandy marl, &c., possess in many cases sufficient capacity of absorption to receive and carry off the waters led into them by means of bores, provided that their ends, as in all negative strata, crop out either on or near distant slopes or ravines, or discharge the water into lower situated caves, seas, lakes, rivers, springs, &c., or, at least, communicate with the latter in some way, although perhaps very complicated.

In both my new undertakings, specially described in the second division of this paper, I have met with, first a subterraneous current of water between the upper fresh-water formation and Jura lime-stone; secondly, a sandy clay marl in the upper fresh-water formation itself; and the intended purpose of the water-absorption was obtained in the first case perfectly, but in the second, as a provisional arrangement, at least sufficiently.

It is not too bold a proposition to maintain that negative artesian wells may be established in all the so-called normal or sediment formations — *diluvium*, the *tertiary deposits* (pliocene, miocene, and eocene), the *chalk formation* (as *e.g.* chalk and chalk marl, upper green sand and gault, lower green sand or neocomien), the *Jurassic rocks* (Weald clay, Hastings sand and Purbeck beds, Portland oolite and sand and Kimmeridge clay, coral rag and calcareous grit, Oxford clay, and Kelloway rock, great oolite, Stonesfield slate, fullers' earth and inferior oolite, and the black jura or the strata of lias), the *trias* (red marls and keuper sandstone, gypsum, muschelkalk or shelly limestone, and new red sandstone), the *Permian system* (magnesian limestone, or zechstein, lower red sandstone or rothliegendes, &c), the *carboniferous deposits* (coal-fields or measures, millstone grit with coal, carboniferous limestone with coal, sandstone, &c.), the *Devonian or old red rocks* (old red conglomerate, cornstone, sandstone, and marls, and Devonshire limestone and slate), the *Upper and lower Silurian deposits* (Ludlow rocks, Wenlock limestone, Caradoc sandstone, Llandilo flags and Cambrian slates), *Cumbrian slaty or primary rocks* (slaty greywacke, chlorite and mica slate, and Longmynd, Skiddaw, &c.), nay, under certain conditions, even the *igneous rocks* (granite, &c., basalt, greenstone, porphyry, serpentine, syenite, &c.*), for, *in all these formations currents of water move in a negative and positive direction, all are more or less fissured, and partly contain cavities extensively ramified.* Either they are fissured by the contraction of their masses, which were liquid in former times, or they are fractured† in various directions in consequence of disturbing forces which have acted upon them.

The localities for the purposes in question are not everywhere equally favourable, therefore, every practical execution should be preceded by a careful geological and hydrographical examination of the ground in question, and, therefore, in all cases a skilful and conscientious engineer only should be entrusted with such a research. It may happen sometimes, and has already happened in France, that, in establishing absorbing bored wells for the purpose of carrying off foul and noxious fluids, it has been necessary to go down to a much greater depth than that of the upper water strata, in order that neighbouring wells might not be infected by such new works. For the inside lining of such negative artesian wells cast-iron tubes have been recommended, in order that all contact of the fluids with the different strata through which they pass may be prevented, and A. Chevalier, to whose treatise we shall return, proposed to dip those tubes, before their application, into melted fat, and afterwards to cover them with a layer of tar.

In reference to the capacity of absorption of the different geological formations, I could enumerate a number of striking examples, but in order to avoid prolixity, I shall here quote only a few convincing facts. A geologist cannot be ignorant of such phenomena, and an unprofessional man may obtain a further information in good geological works.*

The *molasse*, a recent sandstone, in Germany and Switzerland, belonging partly to the pliocene, partly to the miocene deposit, is sometimes fissured in a high degree. It is a fact that, in this formation, negative strata have already been bored, *e.g.*, near Bodman, on the lake of Constance.

We find many other things in "Walchner's Manual of Geology" relating to this subject.

"In England and France, there is the upper *chalk formation*, much fissured, and often penetrated by fissures miles in length. Snow and rain waters soon sink there, and break out abundantly again at the bottom of the chalk mountains as springs. This may be seen in a remarkable manner at the lower part of the steep slope of the chalky Cap Blanc-nez, where powerful jets of water rush forth out of the clefts of the calcareous rock. The Mole, in the county of Surrey, in England, falls into a chalk chasm, and flows on in a subterraneous channel for two miles. But, above all such phenomena, the most noteworthy is the disappearance of the Rhône (Perte du Rhône, in France), which, near Fort Ecluse, rushes down into a chalk chasm, and flows on for sixty paces underground.

"The cleft constitution of the upper chalk formation can be made available for drawing off superfluous water, which, prevented from sinking down by clay strata, accumulates on the surface of the soil, and gives rise to the formation of marshes. By the removal of such stagnant waters, great service is often rendered to agriculture. The drainage of the plain of Paluns, near Marseilles, brought about by King Réné,† gives an example of this kind. That plain, now covered with the finest vineyards, was formerly a large marshy basin, without any outlet. Great sink-holes were carried down to the subjacent cleft chalk limestone, connected by ditches; in this way the whole basin was drained. The drained waters run through subterraneous channels to the port of Mion, near Cassis, where they come forth again in the form of springs."

In the region of the cleft hard chalk-stone, in the environs of Marseilles, we look in vain for springs. Marseilles fetches the water for irrigating the environs (*pour arroser les environs*) from the Durance, a distance of thirty leagues. Through almost the whole of Provence this scarcity of water may be observed, as far as the chalk formation is represented there by a hard fissured

* Any one wishing to obtain a general view of the geological formations of England, may consult:—1. Geological Map of England and Wales, published under the superintendence of the Society for the Diffusion of Useful Knowledge; arranged by Sir Roderick Impey Murchison, G.C.S., F.R.S., Pres. British Association for the Advancement of Science, F.G.S., &c., &c.; London: George Cox, January 1st, 1853. 2. Tabular View of Characteristic British Fossils, stratigrafically arranged; published by the Society for Promoting Christian Knowledge, 77, Great Queen-street, 4, Royal Exchange, and 16, Hanover-street, Hanover-square, Aug. 1853. 3. As for the "Strata of England and Wales in reference to their Springs." see p. 90, &c., in "Rudimentary treatise of Well Digging, Boring, and Pump-work" (with illustrations); by John Geo. Swindell, R.I.B.A. Associate. Third edition; revised by G. R. Burnell, C.E. London: John Weale, Architectural Library, 59, High Holborn, 1854. Also, in Mr. Dempsey's "Rudimentary Treatise on the Drainage of Towns and Buildings" (London, Weale, 1854), p. 72 (Supply of Water), some accounts on this subject are to be found.

† Such a fracture or dislocation is geologically termed a "fault."

* In my German original edition, I especially recommended to Germans the geological works of von Leonhard, at Heidelberg, and Walchner, at Carlsruhe; but England has also an excellent literature in this department, as *e.g.* the works of Lyell, Murchison, &c.

† Also mentioned by M. Arago, in the "Annuaire" for the year 1835, p. 244.

limestone; the waters sink down. The same is to be found in many parts of Greece, where the fissured chalk-stone exists to a considerable extent.

A similar phenomenon is to be met with on the Karst mountain, near Trieste, and far down in Dalmatia. On the whole area of the Karst mountain there are many *subterraneous* waters known, which continue their subterraneous current through fissures and caves communicating with one another. Exactly the same appearance is to be observed in the environs of Adelsberg, in Carniola.

The remarkable peculiarities of the lake of Cirknitz,* which is to be considered as the true key to the knowledge of all configuration of ground, and of all movements of waters in the Julian, Carniolian, and Dinarian Alps, lead us also to instructive meditations on our subject. This lake has caves which supply, as well as absorb water, called, in Slavonic, "Jama Wondaja," "discharging doors," and "Jama Poshira," "engulfing doors."

The *coral rag*, as is well known, permits the waters to fall through almost everywhere; if we direct our attention to the Swabian Alps, we there see a little brook disappear in a cleft of the coral rag in the valley of Amterhausen, not far from Immendingen on the Danube. Upon the subsidence of the waters in that rock, I shall communicate some other examples in the second division of this paper, the results of my own observations, but I must cite here a few interesting facts described by Walchner in his geological work:—

"The general want of water on the plateaus of the upper jurassic limestone (coral rag), is a natural consequence of the numerous clefts and caves in these rocks, just as on the elevated plains of the Swabian Alps, which may be taken as an example. The atmospheric waters there sink quickly down, run off in the interior of the rocks in subterraneous channels, accumulate sometimes in large basins, often in known caves, which serve as reservoirs, and break out at the bottom of the mountains here and there with extraordinary force. It is surprising to see the crystal spring of the rivulet Aach, near the little town of Aach in the Hegau, which runs out of the white coral rag with such force that it sets mill-works in motion a few paces from its source; or the powerful spring near Urspring, in the rocky valley of Blaubeuren, flowing off at once as the Aachbach, and turning mills. Therefore, the valleys are always supplied with water, often in abundance, while the heights are in want of it. The temperature of the springs which come out of the deeper caves or break forth in the ground of the valleys, is throughout somewhat higher than the mean temperature of the place which indicates their ascent from a depth. But their waters, generally, contain but few salts, and no gypsum and no muriate of soda."

As for the Aach-spring, near the little town of Aach, its communication with the Danube seems to be placed beyond all question; Walchner gives on this matter the following notice in his smaller geological work which he has written for Oken's Natural History:—

"In the environs of Immendingen, near Donaueschingen, a considerable quantity of water from the Danube sinks down through clefts. This water flows out again near the little town of Aach, in a deep basin of rock out of clefts of the coral rag and in the form of a large brook, at once turning mill-wheels."

I myself had the opportunity of observing this interesting phenomenon on the spot; Walchner, however, who examined the conditions of it long ago, was kind enough lately to communicate to me the following results of his own research.

1. The miller at Immendingen stops, as much as he can, the holes and the clefts in the bed of the Danube above Immendingen, as without doing so his machinery would not have water enough when the river is low.

2. If the Danube after a thunder-shower in the valley of the Danube, becomes disturbed and muddy, some hours afterwards the Aach spring wells forth disturbed, and plainly shows the people dwelling near, and where there was no thunder-storm, that one has fallen in the valley of the Danube.

The difference of elevation between the Danube near Immendingen and the source of the Aach, near the little town of Aach, is—

Danube near Immendingen	2,190	feet (Badisch.)
Aach-spring	1,597	,, ,,
Difference	593	,, ,,

The two points are nine (English) miles apart.

The *keuper-sandstone* is sometimes deeply fissured; once I bored in the upper region of it, 81-feet deep; I found an absorbent stratum, instead of spring-water; this happened at the early period of my practice, in the year 1833, at Eisenlautern, beneath Löwenstein, in the kingdom of Wirtemberg.

I have already intimated the existence of negative and positive strata in the *muschelkalk* (shelly limestone); the numerous borings undertaken in this formation in Germany for brine and rock-salt have sufficiently proved it; the formation shows considerable disruptions, especially where it has undergone elevations. In the district of Durlach, in the Grand Duchy of Baden, and between this place and Pforzheim, the upper metalliferous muschelkalk is fissured so much that the waters sink, through the crevices, *e.g.*, at Einsingen, Bauschlott, Göbrichen, Stein.

The *new red sandstone* permits all waters sink where its upper laminated and slaty deposit is not covered with the red and variegated marls. Many communities situated upon this laminated sandstone, have no flowing wells in their villages, but only cisterns. The village of Stupferich, not far from Durlach, is situated in a flat basin of this upper division of new red sandstone. Thunder-showers pour considerable masses of water into the bottom of the basin by which the property of the inhabitants of the village is injured; at present they remove the injurious effect of such floods by sinking little shafts before their houses. When the water falls, it flows into these shafts, and runs down without doing any damage.

In the same way I might extend these remarks, and show that all other geological formations and their several strata have many disruptions, and partly ramified cavities, and, therefore, possess a capacity of absorption such as we require for our theoretical considerations and practical purposes; but the observations I have already made may suffice, especially as I have already referred to geological works. As for the rest, those who understand German, may read the notices of the *artesian wells* in Wirtemberg, given by Professor Plieninger at Stuttgart, in the "Correspondenzblatt des Königlich Württembergischen Landwirthshaftlichen Vereins," between the years 1830 and 1820; they will find there the description of the accidental or unexpected discovery of several striking absorbent strata, obtained by perforations for positive artesians wells in different beds."*

(To be continued.)

* See Reisen im Sudostlichen Deutschland, von J. G. Kohl. Zweiter Band. Leipzig, Friedrich Fleischer, 1852, page 325, &c.; and the "Annuaire" for the year 1835 (Paris, 1834) "Notices Scientifiques," par M. Arago, pp. 210-213.

Compare also M. Arago's account in the "Annuaire" for the year 1835, pp. 214—222: "Il y a, meme dans des pays plats, des cavites souterraines dans lesquelles des rivieres s'engouffrent tout entieres."

A METHOD OF PRESERVING WOOD.

BY PROFESSOR DR. APELT OF SAXONY.

(*Translation.*)

The problem of preserving wood has become of great importance, nay, of public interest, by the construction of railways, now forming a large part of our national wealth. Numberless timbers from our forests form the foundation of railways, and are exposed to the influence of the weather and to every change of temperature. The powers of both the atmosphere and the soil are continually destroying his wood. The *daily* loss caused by the rot of sleepers on the Saxon railway lines alone is calculated at 550 dollars (about £185), which would constitute a yearly sum of 200,000 dollars (about £66,700). This present large consumption of wood, with an increasing population and increasing industry will, by degrees, surpass the production of wood, and thus the question arises, how long our forests may satisfy such wants if they are not lessened.

In order to meet that danger and to lessen the expenditure caused by a frequent restoration of the sleepers, several trials have already been made for giving the sleepers a longer duration by some artificial processes. These processes, for the most part, consist in impregnating the wood with metallic salts, such as sulphate of iron or zinc. The different methods employed therein are similar, as far as saturating the sleepers with the salt, but they differ chiefly in this respect, that, according to one system, the sleepers are placed in the solution of metallic salt for a short time only, and at a high temperature, whilst, according to the other system, the sleepers are placed in the solution at a common temperature, but for a longer period. These methods require certain more or less expensive apparatus and hand-labour. Besides, the sleepers have to be conveyed twice over the same ground; those that have not been prepared must be carried to the impregnating apparatus, and, when impregnated, have to be taken away again. Moreover, every method involving the above principle is open to many objections, viz.:—

1. It at present offers no safe guarantee for the future. All these methods are yet of too recent a date, and can present no reliable results for many years. The expected success is, therefore, merely hypothetical, being in no way guaranteed by experience.

2. Even the expected success may be much doubted. Inspection of the sleepers saturated with the hot solution shows that this process has only caused the sapwood or external covering to be impregnated; the heart itself of the wood remains untouched. Now, since the wood of the pine tree usually rots from the inside to the outside, and not, like the oak timber, from the outside to the inside, that method would be objectionable when applied to the pine timber. Besides, the great heat to which the sleepers are exposed in that process, might easily injure the strength of the wood, since the resinous particles are made fluid thereby and withdrawn from the wood. It is true that the metallic salt penetrates more deeply into those sleepers which are placed in a salt solution for a longer period without being boiled, and the more so the longer that period is extended. But another objection may be raised against the expediency of that method, as well as of the boiling process. The impregnation of wood with a metallic salt is only a means to attain a particular object, *i.e.*, the preservation of the wood, which can only be attained if the mineralisation of wood is effected. The process of mineralisation, like the process of petrification of wood, consists of two parts, the first action takes place with the *impregnation*, the second with a slow and gradual *removal* of the organic parts. In the case of a petrifying process, nature introduces, *constantly* and *continually*, the silicates, and, in case of a mineralising process, the metals, which take the place of the organic parts. Quite the reverse takes place with impregnated sleepers. Humidity extracts the substances again, and thus nature withdraws from the wood the metals which have been introduced into it artificially, long before they have completed the slowly progressing mineralisation.

3. All methods of artificial impregnation have the essential defect of being neither applicable to telegraph poles nor to buildings. Now, although no such capital is invested in them as in sleepers, yet their frequent falling down causes great inconveniences in the working of the line.

The rotting of the woody fibre arises generally from its being composed, like all organic bodies, of three basic substances (carbon, hydrogen, and azote), and of comparatively too small a quantity of oxygen for counterbalancing chemically those bases. Therefore, as soon as the vital power of the organic body is extinguished, and the changes going on under its influence cease, those basic substances follow their chemical affinity, saturating themselves with oxygen, partly volatilising in a gaseous shape, and thus producing the gradual destruction of the organic body. Notwithstanding this great tendency of organic bodies to destruction, we find in fossil plants vegetable remains of the remotest antiquity, which nature has preserved for thousands of years without altering their external form or internal structure. The chemical composition alone of the cell of the plant has been altered, organic substances having been substituted by inorganic substances. This process of petrification and mineralisation is, as it were, a hint from nature what direction to take for solving the problem of preserving wood.

I have now succeeded in finding out a mode of preserving wood which harmonises with that leading idea, and which rests upon a different principle from that on which all methods hitherto known are based. Its success is not merely hypothetical, but is founded on an experience of many years. Having been enabled, through mining pursuits, to collect experimental facts on that subject, I can now produce samples of wood which have been for more than 15 years subjected to the process.

1st. The wood is rose-coloured in the inside, and particularly so in the heart, pine wood still more so than any other wood. When consumed it produces red ashes. This red colour of the wood, as well as of the ashes, originates, as will be shown by the following explanation, in the oxides of iron with which the wood has been imbued. 2nd. The wood cleaves well and clear. 3rd. It does not tear crosswise. 4th. It preserves the power of holding nails. 5th. The annual rings of the wood are not severed. 6th. It still splits. 7th. It allows itself to be bent without breaking.

The method which I have adopted for preserving this wood is new and original, not only respecting the *means* which I use, but also respecting the *principle* on which the whole process rests.

I use the so-called sulphureous coal of Oppelsdorf, a peculiar coal, which is not to be found elsewhere, and which consists of finely-divided marcassite (Fe S^2, Fe S) for about two-thirds of its weight. This coal has, as I have found, that remarkable peculiarity of preserving wood by a simple process, which chiefly consists in allowing the sulphuret of iron in the coal to change into sulphate of the protoxide of iron.

The *principle* on which my method rests, and by which it is chiefly distinguished from all others, consists in operating without any apparatus and without any expense for labour, simply using the process of *nature*, which gradually mineralises the wood, and removes the injurious influence of the soil. It is, therefore, the simplest and also the least expensive method that can be devised. The plan of working is as follows:—

The sulphureous coal of Oppelsdorf having been changed into "vitriolic" coal, is brought into *immediate contact* with the wood about to be preserved, whilst the coal, by its hygroscopic nature, attracts the humidity of the atmosphere, and by its being exposed to the influence

of rain, the sulphate of iron contained in the coal is dissolved, and penetrates slowly and gradually into the wood, and impregnates it. Thus the mere contact of the powers of *nature* achieves the process of impregnation with a metallic salt, which by any other method can only be performed by *art* and by the employing of certain fixed apparatus, and it is most remarkable that, according to this method, a power of nature, *i.e.*, humidity, is called upon to effect the preservation of the wood, which, under other circumstances, is the most injurious agent. But not only a *natural* impregnation is obtained thereby, but also the progressive mineralisation of wood, which is the chief point to be effected, a problem in *artificial* impregnation still unsolved. This may be proved theoretically as well as practically.

The rot is produced by the tannin of the wood, which has a great affinity for oxygen, uniting with oxygen, and thereby forming "ulmin," the so-called efflorescent ore (mulm). This oxygen is introduced into wood, which, like pine-timber, rots from the interior, much more by the humidity penetrating it than by the action of the atmosphere. Now, if the penetrating fluid contains a solution of sulphate of iron, the protoxide of iron, which is changed at the same time by combining with the oxygen into oxide of iron, unites with the tannin of the wood to form gallate and tannate of iron, whereby the formation of "ulmin" is prevented, and the rot rendered impossible.* In the year 1836, Professor Göppert, of Breslau, suggested, in a speech delivered in Jena, at the Society for Promoting Natural History, on the subject of petrification of plants (Isis, 1837, part 5, page 341), that in the process of petrification nature did not remove the organic parts by a high temperature, but gradually by a *wet process* through a quiet decay; and he founded his supposition upon the fact that by the forcible process adopted by him for changing plants of the present day into fossil ones, by putting them between red-hot clay plates, the wood had never acquired the solidity of the petrified wood. My own observations confirm his supposition, by adding a positive reason to the negative argument as adduced by him.

The condition of the wood preserved by me tends to show that the practice of my process is in perfect unison with theory. Thus this wood, unlike the artificially impregnated wood, does not contain the sulphate of iron in green deposits between the annual rings; on the contrary, the red colour of the wood, as well as of the ashes, proves that the soluble metallic salt has been decomposed, and the protoxide of iron changed into oxide of iron. Even in allowing this reddened wood to lie for days in water, the latter remains colourless; this being an evident proof that the oxide of iron has not merely been deposited in it *mechanically*, but that it has amalgamated *chemically* with the wood, *i.e.* that the wood is in a state of mineralisation.

Besides this peculiarity of the sulphureous coal of Oppelsdorf for preserving the wood, which rests upon the strong affinity of the iron contained in it with the tannin of the wood, the said coal possesses another remarkable quality. Besides the sulphuret of iron, it contains sometimes a small quantity of arsenate of iron, which, as is well known, by its *mere presence*, is one of the strongest preservatives against rot. This power of the arsenate of iron of protecting the wood against the rot by its mere presence, rests upon the circumstance that it takes up the oxygen introduced into the wood by humidity (since $AsO_{1\frac{1}{2}}$ changes into $AsO_{2\frac{1}{2}}$), neutralising thereby the oxygen.

One peculiar advantage of my method over all others remains to be mentioned. Whilst the wood lies in the ground, two different causes, and quite independent of each other, co-operate in destroying it; the *internal* disposition of the woody fibre to decay is still augmented by the *external* influence of the power of vegetation of the soil. All methods hitherto employed for preserving wood act simply by resisting the decaying powers of the wood itself, whilst they are unable to remove those noxious external influences which are the main cause of injury. According to my method, a vitriolic substance is placed between the wood and the soil, which substance exerts its influence as well on the soil as on the wood, thereby entirely destroying the power of vegetation in the soil which injures the wood, and at the same time augmenting the power of the woody fibre to resist decay.

It is moreover evident that effects are more lasting the longer the cause continues to operate. Now, according to my method, the wood may be kept continually under the influence of a preserving means, whilst with every other method it is exposed only once to a transient influence. Notwithstanding the great simplicity of the principle on which my method is based, it nevertheless combines a variety of advantages. It differs, as I have already pointed out, in many respects from the other methods. Those differences may be summed up thus:—

1. I do not soak the sleepers in a vitriolic fluid, but I surround them with a solid vitriolic body.

2. According to my method, the impregnation of the wood is not effected by art, but by the powers of nature, which act without requiring any expenditure of human labour.

3. According to my method, a gradual process of mineralisation of the wood is begun and continued, the required material thereto being supplied by the continuous *natural* impregnation. In the *artificial* impregnation, on the contrary, a surplus of metallic salt is introduced at once into the wood, which (since it is not decomposed and again chemically continued in other forms) becomes dissolved by the penetrating fluid, whereby the required material for a gradual mineralisation is withdrawn from the wood.

4. Every other method operates only *in one way* upon the wood. My method produces a *double* effect—first, on the wood; next, on the ground on which it lies.

5. According to all other methods, the preserving agent operates on the wood only once, and in a quick, transient mode. According to my method, the agent operates slowly and continuously.

6. Every other method requires a fixed apparatus and the necessary capital for working it. My method may be applied anywhere, and to the sleepers that are already laid down.

7. It saves all the time required for the preparation which with other methods increases the expenses.

8. Lastly, it has the advantage of being not only applicable to railway sleepers, but also to telegraph poles and buildings.

Besides the cheapness and efficiency of my process, I shall only add that I thus render the influences of temperature not only harmless, but even serviceable to the preservation of the wood, and cause nature to perform that which in other processes involves large and complicated apparatus.

* This produces a decomposition of the metallic salt. The protoxide of iron is changed into oxide of iron, and penetrates in the cells in the shape of infinitely small crystals, imperceptible even under the microscope. This substitution causes the gradual agglomeration of these small crystals to take the original shape of the plant cells.

DECIMAL COINAGE.

On Wednesday evening, the 16th instant, at a meeting convened by the Decimal Association, and held in the large room of the Society of Arts, by permission of the Council, a lecture "On the Approaching Simplification of the Coinage" was delivered by Professor De Morgan; W. Brown, Esq., M.P., in the chair.

The lecturer commenced by some observations on the present state of the question. After enumerating the Scientific Commissions, the Report of the Committee of the House, the vote of the House, &c., &c., he stated that

there is no longer any difference of opinion about the advantage of decimal reckoning, in all things whatsoever, except only one. The exception is time. With people in general this matters nothing, since they do not perform arithmetical operations on broken hours and minutes; the astronomer cannot alter his mode of reckoning, since he is obliged to keep himself in connexion with the whole history of his science for 2,000 years past.

At and since the re-coinage of 1816, there had been a gradual disposition to seek for a decimal coinage. The plan called the pound and mil plan had been traced to an anonymous writer, signing "Mercater," in the *Pamphleteer* for 1814. But the lecturer stated that it had been communicated to him by Mr. Hendriks, only just before the lecture commenced, that Simon Stevinus himself, the inventor of decimal fractions, had distinctly recommended that each country should keep its own large coin, and had specified the pound sterling as that which England ought to decimalise.

The various systems which had been proposed had all sunk out of public notice but two, the *pound and mil* system and the *tenpenny* system. These terms were used in somewhat of a sarcastic sense, which was anything but a disadvantage, for nick-names fixed men's minds upon the peculiar points of a system. But then they must be correctly given. For instance, some opponents on the tenpenny side had called themselves Little-endians, and the pound and mil people Big-endians. They had got hold of the poker by the wrong end. Lemuel Gulliver, on whom all relied, except the Irish Bishop, who, when the voyage to Lilliput appeared, declared he did not believe half of it, stated that the Endian dispute arose out of the following dogma :—"True believers break their eggs at the convenient end." Now the pound and mil people believe that the small end was that at which the coinage ought to be broken, and a small crack of four per cent. in the copper served their purpose. But the real Big-endians—the tenpenny people —smashed the sovereign into tenpenny bits, making such a hole, the lecturer contended, as let out all the meat, in getting rid of the pound and shilling. Of the two systems now before the world, the pound and mil required, imperatively, nothing but a diminution of the copper by four per cent., so that the half shilling should contain 25 farthings—whether called farthings or mils,—instead of 24. This change being made, it would be impossible to calculate otherwise than decimally. The lecturer charged the pound and mil advocates with not being sufficiently alive to the distinction between the necessary and the contingent parts of their own plan. They dwelt too much on new coins and arrangements of coins, which were matters of convenience, not making sufficiently prominent, as a full attainment of the power of calculating decimally, the little alteration in the copper above noticed. On another point also he took his own side to task for a misconception of their true position. So long as they occupied the field alone, the little change which they proposed made them innovators and radicals, and they might be aptly compared to the old reformers, who pressed the removal of the franchise from Sarum to Manchester. But when proposals came into notice which involved an entire subversion of the existing coinage, they, the pound-and-mil people, became the conservatives, the tenpenny people and others putting the pound into schedule A, and the shilling into schedule B. This, the lecturer contended, was not sufficiently apparent even to the Decimal Association, which seemed content to be regarded as one innovating body among a number, without reference to its right to be considered the conservator of what exists, with the most simple of all possible proposals for decimalising. The tenpenny plan, which preserved the penny, and introduced a tenpenny coin—which the lecturer called a franc—proposed that the existing coinage should be allowed to continue until gradually absorbed by the Mint, so that, for ten years at least, the tenpence and the shilling would be circulating together. There being nearly 120 millions of shillings, no less time could be allowed. Old persons remembered that, in spite of the re-coinage of 1696, silver coins of Charles II. were in circulation in 1815. Independently of all considerations of convenience in other respects, the concurrent circulation of the shilling and the franc appeared to him practically impossible as matter of arithmetic. He believed, for his own part, that, at the outset, no such thing was intended. He imagined that their first plan was to recall all the existing shillings and sixpences, and to substitute tenpences, and that, when the immense magnitude of the operation came to be considered, the idea of allowing the concurrent circulation was substituted. He considered that both parties had dwelt too much on accounts and large transactions, and that neither party had sufficiently pressed the inquiry into the position of the poor man at the pay-table. For himself, he had had particular means of considering this question. As a mathematician, many writers had objected to his having a voice in the question. He instanced an advocate of the tenpence, who wrote to him in very flattering terms, pressing upon him the tenpenny system. He replied, giving his reasons for preferring the pound-and-mil. The other party rejoined with a regular reproof, asserting that mathematicians in their closets had no right to settle such questions, the writer forgetting that he himself had sought the correspondence and had found his own way to the mathematician's closet. This writer, and many others, had forgotten, or did not know, that he, the lecturer, was an actuary of five-and-twenty years' standing, as well as a mathematician, and had been pretty often brought into connexion with money affairs, to say nothing of his being a teacher of monetary arithmetic. But the lecturer thought he had a position which made him better able to judge than he could have been, either as a mathematician or as an actuary. He had been for twelve years a manager of a saving's bank, and in that capacity had had, scores upon scores of times, to receive or to pay out from two to three hundred pounds in a couple of hours, and in all kinds of sums, from a shilling and some halfpence upwards. When he looked at the bankers' clerk, with his luxurious counter and his convenient scoop, and all his other paraphernalia, he, at the pay table of the savings' bank, looked upon that same clerk as an aristocrat, who knew little of the difficulties of humble life. After describing all the entries which he had to make, and the difficulty of making the poorer classes understand the necessity of the common forms of business, he asked how all this work was to be done in two hours, if both parties had to combine mental arithmetic with counting before they could finish any transaction. Say a poor man came to withdraw 17s. 6d. in a mixed coinage of shillings and francs. Would it be required that two separate bowls should be provided, one to hold the old coinage and the other the new? He believed no man of business would hear of a scheme which required this. Would it be demanded that every payment should involve a casting up on paper? He thought this could not be listened to either. Well, then, it being supposed that shillings and francs were mixed in a bowl, suppose he took out in succession 4 shillings, 4 francs, 1 shilling, 2 francs, 1 shilling, 3 francs, 2 shillings, 2 francs, 3 shillings. Can any one in the room tell me, asked the lecturer, whether I have got beyond 17s. 6d. or not. He considered that any scheme was at once upset which required mental calculation in addition to counting. With reference to the pound and mil scheme, this sort of question never arose. The man received his 17s. 6d. as now, in the same coins, or perhaps with more florins than now. It might go down in his employer's books as 8fl. 75cts., but that was nothing to him. When he came to change a half-shilling, his rule would be to get a farthing *more change*. If he bought a threepenny loaf, he would know that he ought to get 3¼d. back instead of 3d. To those who had no

books to keep, and no sums to do, this was all. The lecturer enforced the difference of the two systems as they affected those who could do no more than count, in various ways, and ended by hoping that some advocate of the tenpenny scheme would stand up and explain how the poor man, who was no calculator, except in merely knowing how to count, could be made to know he had got his 17s. 6d. in the mixed francs and shillings. He had previously said a few words on the international coinage, classing its supporters by implication with the tenpenny people, and explaining that the exchange would introduce the existing complexities of calculation, even though all nations had the same coinage. He expressed his belief that nothing could shake the pound, and that he was satisfied the only point was to prevent the tenpenny system from impeding that of the pound and mil. He no more expected a strong mercantile feeling against the pound than against the Habeas Corpus Act or the National Debt. In reference to the convenience of the different coins for alteration, the lecturer contended that the pound was to the rich, and the shilling to the poor, the coin of slower fluctuation. Ten pounds' worth of furniture might vary much in quantity and quality in the course of a dozen years; but it would not vary by starts. Wages, measured in shillings, might be nearly doubled or halved; but this would be a work of time, and unmarked by great sudden changes. But the pennyworth of goods sold for copper was one thing to-day and another thing to-morrow. A few showers of rain before harvest would very quickly make a difference of much more than 4 per cent. in the bread sold for threepence. So that, in fact, the poor man was really accustomed to rapid changes in the value of the copper. As to the robbery and spoliation, as it was termed, of taking a fraction of a farthing, for one occasion only, from one man, and giving it to another, the lecturer contended that every government had to do much harder things in the way of taxation, and that, in the present instance, the poor man would be repaid most amply by the simplification of money arithmetic, which would give his children a much better chance of rising into commercial employment.

The discussion announced in the programme was commenced by

Mr. JAMES YATES, a prominent advocate of an international and uniform system of weights and measures, who spoke at some length. He spoke highly in favour of an international system; praised highly a proposal of the French government to that effect, at the time of the first French revolution; complained of the tone of the publications of the Decimal Society; and claimed for those whose views he advocated the merit of being more decimal than those who styled themselves decimalists by pre-eminence. Mr. Yates declared himself strongly in favour of a silver standard of value in preference to a gold one; and, as an argument in favour of introducing the franc, adverted with much force to the fact that prices current were universally quoted in shillings—that here in one of the main items of their accounts, the pound sterling was universally rejected by merchants of every grade throughout the kingdom. Mr. Yates complained of the international plan being confounded with the tenpenny system, with which it had nothing to do. He maintained the necessity of a smaller coin than the farthing, and produced some articles in common use for which smaller coins were wanted.

Lieut.-General Sir C. W. PASLEY briefly replied to Mr. Yates, and explained that he considered the metrical system very far from perfect. General Pasley noted with particular exultation that the French had found it impracticable to issue more than one volume of their Nautical Almanack on the decimal system.

Mr. ROBERT DAWBARN, of Wisbeach, Cambridgeshire, made some brief but practical remarks, which were very favourably received by the audience. He adduced examples of easy calculation on the Belgian and American systems, and contrasted therewith the perpetual confusion of accounts that prevails in most of our colonies, but more particularly in Canada, where three or four conflicting currencies keep the trading population in a fever of perplexity.

Mr. J. A. FRANKLIN replied to Mr. Yates; and, as regards an international coinage, laid much stress on the fact that the Belgian franc did not circulate in France; and that, though the French and Belgian francs were the same, there was a rate of exchange between the two countries; as well as that the Australian sovereign, though identical in weight, size, and appearance with our own, would not pass current in England at par.

A GENTLEMAN, whose name we did not learn, insisted on international currency; and as a member of the International Association, denied that they had anything to do with the question of gold or silver standard. He then insisted on an old argument—namely, that the pound and mil scheme required three decimal places, whereas the franc and dollar schemes require only two.

It being understood that an adjournment would take place,

Professor DE MORGAN, in reply, said that the pound and mil men considered the international people as tenpenny people, because they preferred the French franc, which was 9½d. and a fraction; and they, the pound and mil people, did not stand on small fractions of farthings. If, however, the internationals proposed to withdraw all our silver at once, so that their francs should not circulate with shillings, he admitted that they must be met on different grounds. With reference to the necessity for smaller coins, he adverted to the known fact that government had tried to introduce the half-farthing, and had failed. As to the question of two or three decimal places, he reminded the meeting that franc and dollar nations were already used to *two* subdivisions of the leading coin, and so fell naturally into two decimal subdivisions; but that we, on the other hand, were equally used to *three* subdivisions—shilling, penny, and farthing—and should with equal ease, fall into the three decimal subdivisions of pound, cent, and mil.

Mr. ROBERT ROWAN MOORE moved, and Mr. T. A. WALLEYS seconded, an adjournment of the discussion, which was unanimously agreed to by the meeting; and, after a vote of thanks to the Chairman, the meeting separated, on the understanding that the discussion would be resumed either on the following Wednesday, or such other evening as the Society of Arts could conveniently spare the use of the room.

Home Correspondence.

EDUCATION OF GIRLS.

SIR,—That education should be based on religion there can be no doubt; but, as discussions on this subject are forbidden by the Society of Arts, nothing more is said of it in the following observations than that education should be such as to enable a child to do its duty in that station of life to which it has pleased God to call it.

Although the Dean of Hereford, that most able promoter of education, is averse to the plan of school nurseries, yet it can hardly be denied that in populous towns there must ever be many instances when mothers are *forced* to leave their infants to the care of others, whilst they go out charing, or are otherwise employed in earning a livelihood.

It seems desirable that the pay for such infants should be equal to the expenses of food, &c.; for if the nursery be gratuitous, mothers might be induced to place their babies in them merely to get rid of the charge. And, with a well-selected motherly matron, even little girls could be taught to take care of the infants, and thus the

benefit would be twofold, by teaching them the management of children should they become mothers themselves. Amongst the many advantages obtained, they would learn the necessity of cleanliness, both in person and food, so essential to their well-being. Proper ventilation and means of taking exercise, such as the baby-jumper, should also be provided. And, of course, their mothers should at stated times be allowed to suckle their offspring, whose artificial food should never be permitted to get sour, as that is the most injurious and frequent source of illness in the poorer classes. Habits of order cannot be too early inculcated, especially not wilfully to destroy things, which infants are too apt to do. And, lastly, it may be observed, that a mere baby may be taught to join its little hands in prayer, even when it cannot yet articulate the words.

It is a general defect in schools for girls that they are not taught what is most useful to fit them for service, or to become good wives or mothers. Even when not strong enough to scour, they might early be taught to sweep and dust carefully. The school-rooms, both boys' and girls', would afford an opportunity of doing so, and the cleaning the church might be done by the most deserving and careful.

I am, Sir, your's truly,
M. S. BENTHAM.

SOLID INK.

SIR,—Some time since I tried an experiment to make a solid ink (to be used in a case) with Frankfort black (manufactured from the cuttings of the grape vine) and linseed oil. I succeeded in making it indelible, so that it would not rub off, but I could not make it sufficiently firm. Being informed there has been an oil extracted from tobacco, more drying than any previously known, it suggested the idea that it may prove the needed requisite; or probably some of your numerous readers may succeed in accomplishing that which I believe could be made a source of incalculable wealth, and to the million a friend, to supersede the pen and blotting paper.

I am, Sir, &c.,
G. N. SHORE.

Lyme Regis, 16th July, 1856.

ANALYSES OF THE IRON ORES OF GREAT BRITAIN.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY.

SIR,—I cannot resist expressing the satisfaction I feel at this publication of the first steps of a great national work now undertaken by the Jermyn-street establishment. It is now more than 50 years since my father, with an ardent zeal, indicated such a comprehensive series of analyses as one of the most valuable scientific enterprises which the intelligence of this country could achieve. Through a long and active life he continued always to look forward to a period when he might have leisure to place the iron manufacture of his country on a firm and extended basis, by the chemical investigation of all the materials employed in it. But in truth the task is too great for any one man to accomplish, even with the devotion to it of his whole time. It is the fit undertaking for the united efforts of a public institution, and if this government school proceeds with vigour in prosecuting the work thus happily commenced, its teachers will indeed produce an intrinsic exchangeable value for the large yearly votes of public money accorded to them. I would strongly recommend that the series of analyses should be made at once complete, and that with every specimen of iron ore, the coal and fluxes used in smelting it should be also analysed, and the whole results be tabulated together. This would render every step of progress complete *in se*, and the performance would be more easy, more satisfactory and interesting, when accompanying the iron ores, than by postponement to some remote period. The analyses of the whole of the iron-making coals of Great Britain, published in 1840, in my father's papers on "Iron and Steel," is the most comprehensive work of the kind ever executed by an individual, and, as is well known, furnished the hint and the basis for the experiments which Sir H. de la Beche subsequently superintended for government. But these do not proceed to chemical detail, in its immense minutiæ; they give merely the carbon, the earth, and the volatile matter by dry distillation. The chemical composition of the ashes and of the gaseous contents of the coal, are the proper work for a great chemical school, and, added to the analyses of the flux employed with each specimen of ore, will complete the scientific and practical value of the publication. Dr. Percy very truly remarks in his preface, that the value of the analytical investigation would be greatly enhanced by a corresponding investigation of the iron produced, and with equal correctness he indicates the great skill and persevering labour which such a work would require. Carried to its full extent it would, indeed, be a task as vast in its toil as in its benefits, and demand a rare union of comprehensive practical and scientific acumen and industry. But a beginning, and a sure foundation, will at least be made by recording a complete series of the composition of the raw materials, ready for some master mind to examine and classify in reference to the metallic produce. And, as preparatory to this, it would be well to lose no time in accumulating specimens of both the cast-iron and the bar-iron, before time leads to any change in the use of the united materials. Some singular facts appear on comparison of the results printed now in part first. For instance, the very large proportion of organic matter in the ironstone which yields the high quality Lowmoor iron is suggestive of the valuable effects formerly attributed to animal charcoal in steel-making and other processes of iron manufacture. I am a little surprised to notice the absence of any traces of lead in the specimens of Weardale ore. This ore, from Stanhope and Towlaw works, is the matrix of the lead veins of that district; and a speculation for smelting extensively, at great profit, the vast accumulated spoil heaps of the ancient lead mines, which led to the erection of these ironworks, was materially impeded and impaired by the rapid destruction which the combined lead on these matrices effected on the interior of the furnaces, and I should have expected this metal to be prominent in the analyses. Soon afterwards, the discovery of the very different deposit of ore commenced, at Consett, the present great extension of the iron manufacture of Durham and North Yorkshire. I can only say to Dr. Percy, go on and prosper, for, as was so generally pointed out in the discussion on Mr. S. K. Blackwell's paper read at your meetings in December and January last, the search after quality is not the ruling consideration in the private mind of the British ironmaster, and, therefore, there is the more reason why public institutions should take up, as a public question, researches for the national benefit into the causes of superior quality, from which all who choose may profit. To re-quote the important quotation, concluding Dr. Percy's preface, "the manufacture of iron is the basis and index of modern civilisation, and every effort tending to improve it is a matter of general welfare." A text of which the truth and the importance are alike undeniable, and suggestive of infinite topics of remark, but I have now trespassed sufficiently on your space, and shall beg to forward for your next number some further observations on this important publication by the expressed authority of the Lords Commissioners of her Majesty's Treasury.

I am, &c.,
DAVID MUSHET.

July 21st, 1856.

Proceedings of Institutions.

RADWAY (NEAR BANBURY).—On Wednesday, the 9th, was held the annual general meeting and rural *fête* of the Mechanics' Institution. The members met at the Institution at three o'clock, to transact business, elect officers, &c.; afterwards they proceeded through the village to Ivy-lodge, where, by the kind permission of the owner, about 130 members and friends sat down to tea in the grounds. Racing, jumping, and other rural amusements followed, and at seven the party adjourned to the school-room, to hold the evening meeting. Mr. George Miller, the Vice-President, took the chair, and opened the proceedings. The meeting was afterwards addressed by the Revs. W. S. Miller, C. D. Francis, and E. R. Johnson, and by Mr. Shephard, of the Coventry Mechanics' Institution. At the close of the meeting, dancing commenced. During the past half-year, this Society has much improved; the evening attendance has been very good, and a greater number of books has been taken from the library than in any half-year before, and these have been of a higher stamp than heretofore. The number of books taken from the library was 602; of periodicals, 125; in all, 727; giving an average of 8·55 to each member.

ROYSTON.—On Tuesday, 15th inst., Dr. Charles Steggall, Trinity College, Cambridge, delivered a lecture, for the benefit of the building fund of the Royston Mechanics' Institute, on the Chamber Music of England in the 18th and 19th centuries. Dr. Steggall commenced with a brief epitome of his former lecture on chamber music down to the time of Purcell, on whose extraordinary works he made some additional comments. Dean Aldrich and Dr. Tudway received their share of attention. Handel's life and mighty genius were warmly dilated on; and after some brief remarks on the works of Dr. Green, Dr. Boyce, Dr. Arne, S. Webbe, and Dr. Calcott, the productions of Sir Henry Bishop were highly commended. The lecturer spoke of the extraordinary influence of the church over the music of the country; he lamented that the Reformation, fraught though it was with blessings, seriously impeded the progress of the Fine Arts; he offered a tribute of praise to Mr. Hullah for his efforts to improve the taste of the people; and he alluded to one of his countrymen, Professor Sterndale Bennett, who had rendered eminent service to music. In conclusion, Dr. Steggall took a hopeful view of the prospects of music in this country. Master Stainer, Messrs. Barnby, Cummings, and Howe, from London, assisted in the vocal illustrations. Professor Sterndale Bennett assisted in the illustrations by playing a selection from Handel's harpsichord lessons on the pianoforte, and the accompaniment to Handel's chorus, "Galatea, dry thy tears." The professor's performances were listened to with the deepest attention. At the conclusion, a vote of thanks to Dr. Steggall and Professor Bennett was unanimously carried, on the motion of Mr. John Phillips, seconded by Mr. F. N. Fordham. Dr. Steggall returned thanks on behalf of the professor and himself.

WIRKSWORTH,—A *fête*, in connection with the Wirksworth Mechanics' Institution, took place on Thursday, the 26th ultimo. The Institution is now in the fourth year of its existence, and it has overcome the difficulties attendant upon its establishment, and is steadily increasing in usefulness and importance. It was at first intended that only an exhibition of mineral specimens, paintings, &c., should be held; but as the president (W. Cantrell, Esq.) kindly placed his grounds at the disposal of the committee, it was thought that a step further than an exhibition might be attempted, and hence the resolve to hold a festival. A committee of ladies, in conjunction with the committee of the Institution was organised, for the purpose of making the necessary arrangements for the tea to be furnished on the occasion, and through their exertions sixty trays (the gift of the ladies of Wirksworth) were placed at the disposal of the committee. About noon most of the shops were closed, and the inhabitants wended their way to the president's house, in the vale of Wirksworth. Two telescopes, which stood on the lawn, were in full requisition all the day. In the house was displayed the collection of mineral specimens, paintings, and works of art, gathered from around Wirksworth. In the first room were a "Cattle Scene," Portrait, by Rawlinson, belonging to W. Cantrell, Esq. "The Chase, Melbourn," belonging to Mr. Swift, Derby. Portrait, by Wright, R.A., "Old Market Cart." Scene, by Rawlinson, belonging to W. Wright, Esq., "The Jealous Husband." Head, by Spagnoletto. "Market Scene" (a very remarkable Dutch picture); Portrait, said to be of Nell Gwynne; and an Ice Scene, all belonging to the Rev. J. Edwards. Portrait, by Romney, R.A., and "Bacchante," by Romney, belonging to the Rev. R. M. Jones. "Scene in the Garden of Buckingham Palace," by Vawser, jun.; "Welsh Scene," by Barker, jun., Bath; "Scene," by Vawser, jun.;" and "Scene after Wouvermann," belonging to the Rev. J. Edwards. "Old Dutch Scene," also a large painting, supposed to be by Titian, belonging to W. Wright, Esq. "News!" Old man reading paper over door, belonging to W. Cantrell, Esq. Mineral Specimens:—Case of mineral specimens, belonging to T. Poyser, Esq. Case containing old coins. Minerals. Portion of ancient miner's spade, ancient miner's pick, and other tools. Case of mineral specimens. Large stalactite. Fossil back-bone of icthyosaurus, belonging to A. Harward, Esq. Collection of mineral specimens of W. Cantrell, Esq. Case of birds, belonging to T. Poyser, Esq. Case of insects. Puzzle, from the island of St. Domingo. Apparatus illustrating Foucault's pendulum proof of the rotation of the earth. Case of Indian work. Model of palanquin, and costumes of Madeira. Chinese shoes—woman's size. Indian toad, &c. A Boscobel box, silver mounted, with King Charles in the oak-tree. In passage or entrance-hall:—Sketch, by Miller, "Death of Amelia," from Thomson's "Seasons," after Wilson; "Burgomaster and Daughter," by Stephanoff; "Rabbit Shooting," by Huskisson, all belonging to the Rev. J. Edwards. Portrait of Whitehurst, the geometrician, by Rawlinson; "Dove Dale," by Wright, R.A.; and Portrait of Dr. Darwin, belonging to T. Poyser, Esq. Curious engraving of head of Christ in one line, beginning at nose. Engraving of "Crucifixion," from Van Dyke. Engravings of "A Fine Old English Gentleman" (the late F. Hurst, Esq., and J. Strutt, Esq.) Sketch of two well-known Wirksworth characters (Jemmy Tinsley and John Ludlam), by a Wirksworth lady. Microscopes, &c. Second room:—Two very amusing engravings, "Musical Bore," and "Time and Tide wait for no Man." "Miser Counting Treasures." A collection of 100 photographs, nature prints, and chromolithographs, lent by the Society of Arts to the Institution for the occasion, amongst the most remarkable of which were "Faith," "L'Allegro," "Penseroso," "Bud and Blossom," and "Walter and Jane," from Bloomfield's "Farmer's Boy." A plan of a "New Public Townhall, Wirksworth," designed by Mr. J. W. Pickard, of Manchester, attracted much attention.—Music, vocal and instrumental, and dancing, were added to the other attractions, the inhabitants of Wirksworth and its neighbourhood gratuitously affording their services in the orchestra. Tea was served in tents built for the occasion by Mr. G. Frost, and Messrs. Killer and Spencer, and covered with rick-cloths, along which were four tiers of tables. The tents were twice filled and no less than 1,780 partook of the refreshment. The arrangements for tea were most admirable. The farmers of the neighbourhood most liberally provided an abundant supply of cream; some idea may be gathered as to the quantity sent, from the fact that more than two gallons were left in store. Mr.

Joseph Wheatcroft purchased 130 tickets of admission, which he gave to the hands in his employ. Tea being over, the price of admission was reduced to 6d., and large numbers of people availed themselves of the opportunity, until the number of people on the ground exceeded 2,000. After tea, play commenced in right earnest, dancing being principally indulged in, though tag, leap-frog, and other games had their respective admirers. Amongst the company assembled at this time were Sir Henry Fitz Herbert's family, from Tissington-hall; J. Wright, Esq., and Mrs. Wright, Hulland-hall; Miss Arkwright and party, — Peel, Esq., and Mrs. Peel, Miss Hurt, Captain Hurt, Rev. T. T. Smith and family, Rev. J. Edwards and family, Rev. F. H. Brett and Mrs. Brett, Rev. C. H. Owen, Rev. R. M. Jones, T. Poyser, Esq., Mrs. and Miss Poyser, Dr. Webb and Mrs. Webb, Mrs. Newbold, W. Wright, Esq., J. Wheatcroft, Esq., and Mrs. Wheatcroft, A. Harward, Esq., and Mrs. Harward, J. Stone, Esq., and Mrs. Stone, Mrs. P. and Miss Hubbersty, Mr. E. Edwards, Miss A. Wall, Miss Sudlow, J. Allen, Esq., J. J. Kenderdine, Esq., Mrs. S. Hall, Miss Brace, Miss Stone, Mr. L. Alsop and Mrs. Alsop, J. Parkin, Esq., Messrs. Tatlow, Mr. J. Walker, Mr. R. Wall, Mrs. Allen, Miss Tomlinson, Mr. Kirkland, and the officers of the Institution—W. Cantrell, Esq. (president), Mr. M. Peel (vice-president), Mr. Surtees (secretary), Mr. Street (treasurer), Dr. W. Webb, Mr. Fryer, Mr. R. Wall, jun., Mr. T. Newton, jun., Mr. J. Baxter, Mr. W. Hall, Mr. T. Savage, Mr. W. Carrington (committee). About seven o'clock the chair was taken by T. W. EVANS, Esq., who addressed the assembly at considerable length on the advantages of Mechanics' Institutions, making some very judicious observations as to the method of instruction which they should be the means of conveying. In conclusion, the chairman expressed the pleasure he had experienced at his visit, and congratulated the assemblage upon the success which had attended the festival.—Mr. CANTRELL, as president, addressed the meeting upon the present condition and future prospects of the Institution. He characterised their position as a peculiarly happy one, and looked with hope for the future.—The Rev. J. EDWARDS then proposed the following sentiment:—"Prosperity to the Wirksworth Mechanics' Institution, and to all similar Societies, as the chief sources and most effective promoters of the intellectual cultivation of the people."—The Rev. F. H. BRETT cordially seconded the sentiment.—Mr. E. EDWARDS proposed the next sentiment: "The continued enlargement of the means for the cultivation of taste among the people, and for the development of the great mechanical and engineering skill of the English nation," which he enforced by some judicious remarks and allusions to distinguished men who, by cultivating their minds, had raised themselves to their present proud position,—Mr. J. FRYER seconded the resolution.—Mr. POYSER moved the next sentiment: "The education of the people, as the means of the development of those high faculties with which the All-wise has endowed man; and, as, in this view, the source of the highest and purest earthly enjoyment."—Mr. M. H. CANTRELL seconded the resolution.—Dr. WEBB introduced the next sentiment: "The press, as the greatest providential manifestation of human means for promoting and securing the advancement of literature, science, and civilisation," and eloquently pleaded the cause of the Institution.—Mr. W. WRIGHT seconded Dr. Webb's resolution.—Mr. E. WASS proposed, "The principles upon which these societies are based are those which, while they leave to every man the right of free judgment, yet, from their universality and truth, tend to produce in society the greatest amount of general good."—Mr. CARRINGTON seconded the resolution.—Mr. STONE proposed "The Ladies," whose presence that day was one of the good things of the *fête*.—Votes of thanks were then, on the motion of the Rev. J. EDWARDS, passed to the musical friends; on that of Mr. SURTEES, to the President; and on that of the PRESIDENT, to the Chairman.—The National Anthem was sung, and three hearty cheers given for the Queen, and three for Mr. and Mrs. Cantrell at the close. As soon as it was dusk, an illumination was displayed in front of the house, consisting of "V. A." with a star in the centre, in gas jets; and then the fireworks—a very creditable part of the programme—were let off under the superintendence of Mr. J. T. Marsh. The *fête* was entirely successful, and will long be remembered in the annals of Wirksworth. On Friday, the grounds were thrown open to all the children in the neighbourhood, and the ladies' and gentlemen's committees met and took tea together. After tea, dancing was introduced, and another evening passed most pleasantly. As so great a number of people were collected on Thursday, it was impossible to obtain more than a cursory view of the mineral specimens, &c.; Mr. Cantrell has therefore kept open the exhibition on the evenings of Saturday, Monday, Tuesday, and Wednesday.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on 10th July, 1856.

130. Bills—Customs (No. 2).
224. Bills—Nuisances Removal, &c. (Scotland) (No. 2) (Amended.)
225. Bills—Consolidated Fund (Appropriation).
227. Bills—Unlawful Oaths (Ireland).
228. Bills—Militia Pay.
229. Bills—Grand Jury Cess (Mayo).
230. Bills—Railways Act Continuance (Ireland).
Public General Acts—Cap. 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, and 43.

Delivered on 11th July, 1856.

325. Prizes (Revenue Cruisers, &c.)—Abstract of Returns.
318. New Westminster Bridge—Plans.
178. Assurance Companies—Return.
130. Bills—Customs (No. 2) (a Corrected Copy).
223. Bills—Civil Service Superannuation (a Corrected Copy).
235. Bills—Episcopal and Capitular Estates Continuance.
232. Bills—Grand Juries (Lords' Amendments).
233. Bills—Cambridge University (Lords' Amendments).
234. Bills—Indemnity.
236. Bills—General Board of Health Continuance.
237. Bills—Formation, &c., of Parishes (as Amended by the Select Committee, and in Committee).

Delivered on 12th and 14th July, 1856.

253. Civil Contingencies—Returns.
335. County Surveyors (Ireland)—Returns.
342. Poor Relief (Birmingham, &c.)—Copy of Letter.
321. Constabulary (Ireland)—Statement.
326. Spirits and Malt—Return.
339. Fines and Penalties (Ireland)—Abstract of Accounts.
219. Bills—Criminal Appropriation of Trust Property.
238. Bills—Court of Appeal in Chancery (Ireland) (as Amended in Committee, and on Consideration of Bill, as Amended).
239. Bills—Judgments Execution, &c. (Amended).
240. Bills—Income and Land Taxes.
241. Bills—Ecclesiastical Courts, &c.
242. Bills—Stamp Duties.
243. Bills—Race-horse Duty.
244. Bills—Marriage Law (Scotland) Amending (Amended).
245. Bills—Formation, &c., of Parishes (as Amended by the Select Committee, in Committee, and on Consideration of Bill, as Amended).
246. Bills—Lunatic Asylums Act Amendment.
Convict Prisons—Report by Colonel Jebb.
Site of Smithfield—Report.
Criminal Offenders (Ireland)—Tables.

Delivered on 15th July, 1856.

248. Bill—Coast Guard Service.

Delivered on 16th and 17th July, 1856.

300. Wexford Harbour—Report of Captain Vetch.
344. County Treasurers Fee Fund (Ireland)—Account.
249. Bills—Evidence in Foreign Suits.
250. Bills—Charities.
251. Bills—Lunatic Asylums (Superannuations) (Ireland).
247. Bills—Imprisonment for Debt.
252. Bills—County Courts Acts Amendment (Amended).
253. Bills—Cursitor Baron of the Exchequer.
Public General Acts—Cap. 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, and 54.

Delivered on 18th July, 1856.

352. St. James's, &c., Parks—Account.
358. Income Tax, &c. (London)—Return.
359. Australian Postal Service—Copy of Tenders, &c.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette July 18th*, 1856.]

Dated 11th June, 1856.

1386. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the manufacture of safety paper. (A communication.)

Dated 1st July, 1856.

1540. James Atkinson Longridge, 17, Fludyer street, Westminster—Improvements in the application of mechanical power to ploughing and other field operations of agriculture.
1542. John Lacey Davies, jun., and John Broadbent, Manchester—Certain improvements in umbrellas and parasols.
1544. Alfred Vincent Newton, 66, Chancery-lane—An improved construction of door lock. (A communication.)
1546. George Edward Dering, Lockleys, Herts—Improvements in galvanic batteries.
1548. Matthew Hill Loam, Nottingham—Improvements in meters for measuring water and other fluids.

Dated 2nd July, 1856.

1550. Joseph Henry Van Hengel, 531^{s}, Chaussée de Malines, Antwerp—Improvements in apparatus for raising and lowering bodies in mines.
1552. James Fleming, jun., Newlands-fields, Renfrew—Improvements in bleaching, washing, cleansing, and preparing textile fabrics and materials.
1554. Edwin Green, Birmingham—Improvements in the manufacture of buttons.
1556. Alfred Nourisson, 10, Rue des Petites Ecuries, Paris—Improvements in drying and burning bricks and other articles of clay.
1558. John Williamson and James Cochran Stevenson, South Shields—Improvements in evaporating saline solutions.
1560. William Hickling Burnett, Margaret-street, London—Improvements in electric telegraphs, and in apparatuses employed therein.
1562. Alfred Vincent Newton, 66, Chancery-lane—Certain improvements in machinery for manufacturing rope or cordage.—(A communication.)

Dated 3rd July, 1856.

1563. John Pendlebury, Crumpsall, Lancashire—Improvements in machinery or apparatus for bleaching or cleansing textile fabrics or materials.
1564. Joseph Ewing, Cirencester—A new or improved portable receptacle for urine and other human secretions.
1565. John Caleb Hall Peirce, Upper North-place, Gray's-inn-road—Improvements in glass chandeliers, lustres, and other such means used in lighting.
1566. David Curwood, Grocers' Hall Court—Improvements in horse rakes, which improved rakes may also be rendered applicable for scarifying land.
1567. Joseph Brown, 71, Leadenhall-street—Certain improvements in hats and caps.

Dated 4th July, 1856.

1568. Hilton Greaves, Oldham—Improvements in looms for weaving.
1569. Edwin Greenslade Bradford, Torquay—An improved rudder.
1570. Thomas Chandler, 58, Paradise-street, Rotherhithe—A lever cask stand.
1572. Robert Luke Howard, 85, Whitecross-street, London—Improvements in valves for regulating the flow of fluids.
1573. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in machinery or apparatus for cleaning and carding cotton and other fibrous substances. (A communication.)
1574. Louis Cornides, 4, Trafalgar-square, Charing-cross—Improvements in cementing and uniting together plain or ornamented surfaces of glass, or in uniting surfaces of glass to surfaces of metal or other material.

Dated 5th July, 1856.

1575. Edwin Travis, Oldham, and Joseph Louis Casartelli, Manchester—Certain improvements in steam engines.
1576. Jens Foss, Manchester—Improvements in machinery for cutting and sawing.
1577. Joseph Adshead, Manchester—A new application of a known material to be used as a substitute for plastering, painting, papering, whitewashing, and colouring.
1578. Joseph Lewtas and John Humphreys the younger, Manchester—Improvements in apparatus for holding and releasing cords, chains, bands, or bars.
1579. James Alexander Manning, Inner Temple, London—Improvements in the manufacture or production of manure.
1580. Paul Charles Joseph Léonce de Combettes, Lyon, France—An improved steam-engine.
1581. Jean Marie Letestu, Paris—Certain improvements in extracting liquids and solid or pasty matters.
1582. Thomas Smith, Bredfield, Suffolk—Improvements in horse rakes.
1583. Lorenzo Blackstone, Lawrence-lane, London—Improvements in the manufacture of corks and bungs. (A communication.)

Dated 7th July, 1856.

1584. Frederic James Pilliner, Hatfield-street, Stamford-street, Blackfriars-road—Improvements in clasps or fastenings for waistbands and other descriptions of bands or straps.
1585. Robert Millward, Patricroft, Manchester—An improved instrument which may be used as a screw key or gauge.
1586. Robert Shaw, Portlaw, Waterford, Ireland—Improvements in obtaining pressure applicable to machinery for preparing and spinning cotton and other fibrous materials, and other purposes.
1591. George Sampson, Bradford—Improvements in finishing fabrics.
1592. William Colborne Cambridge, Bristol—An improvement in the construction of press wheel rollers and clod crushers.
1593. Henry Smith, Brierley Hill Iron Works, Dudley—An improvement or improvements in the manufacture of harrows.
1594. James Horsfall, Birmingham—An improvement or improvements in the manufacture of wire rope.
1595. William Laing, Denny, Stirling, N.B.—Improvements in stretching or breadthening woven fabrics.
1596. Paul Charles Joseph Léonce de Combettes, Lyon, France—Certain improvements in rotary steam-engines.
1597. Edward Charles Healey, Sidmouth-lodge, Old Brompton, and Edward Ellis Allen, 376, Strand—An improvement in preparing for use veneers, paper, and other fabrics or sheets made of fibres.
1598. Henry Bollmann Condy, Battersea—Improvements in defecating or purifying acetic acid and other solutions, also in disinfecting rooms and other places, and in preserving wood.
1599. John Henry Noone, 1, Peter-street, Sun-street, Bishopsgate—Improvements in apparatus for retarding and stopping carriages on railways.

WEEKLY LIST OF PATENTS SEALED.

Sealed July 18th, 1856.

135. Miguel de Bergue.
149. Edward Pickering.
157. John Coope Haddan.
177. Alexandre Tolhausen.
189. Charles Rothwell.
237. William Henry Lancaster and James Smith.
282. George Norgate Hooper and William Hooper.
299. Elisha Smith Robinson.
785. Etienne Laporte.
1118. Barnett Samuel.
1179. John Wilkes, Thos. Wilkes, and Gilbert Wilkes.
1219. John Charles Pearce.
1223. Job Cutler.

Sealed July 22nd, 1856.

185. Stephen Norris.
190. John Strafford.
191. John and George Gimson.
198. Andrew Shanks and Francis Herbert Wenham.
210. George Napier.
212. Edward Vincent Gardner.
218. William Beasley.
222. John Wormald.
230. William Asbury.
287. Benjamin Franklin Miller.
289. James Townsend Ward.
310. Michael Leopold Parnell.
3. Richard Archibald Brooman.
340. Charles Walker.
359. Richard Archibald Brooman.
464. George Holme Spencer.
573. Frederick Hale Holmes.
748. Samuel Getley.
1066. William Edward Newton.
1213. Edward Hammond Bentall.
1288. William Needham and James Kite (Secundus).
1316. Christian Rudolph Wessel, and Francis Xavier Kukla.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

July 14th.

1688. Charles Goodyear.
1690. Charles Goodyear.
1693. Charles Goodyear.
1694. Charles Goodyear.
1695. Charles Goodyear.
1701. Benjamin Burrows.
1714. Charles Breese.

July 15th.

1705. John Wallace Duncan.
1728. Edward Cockey, Henry Cockey, and Fras. Christopher Cockey.
1731. Thomas Gray and John Reid.

July 16th.

1736. William Huntley.

July 18th.

1712. Peter Armand le Comte de Fontainemoreau.

July 19th.

1718. James Shield Norton and Henry Jules Borie.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3857	July 11.	Improved Date Indicator	Waterlow and Sons	London Wall.
3858	,, 14.	Needle Case	A. G. Baylis and Co.	Redditch.
3859	,, 15.	Watercloset Cistern for constant supply.	James and Matthew Robson	North Shields.
3860	,, 17.	Nouvel Albert Boot	Henry Whittell	Leamington.
3861	,, 24.	Fastening for Bottom of Railway Hopper Waggon	William Prince Marshall and John Ross	Birmingham.
3862	,, 24.	Gas Stove	George Neall	Northampton.